Investigation of a new approach for the modelling of subglacial hydrology.

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Field observations show that subglacial hydrology and glacier dynamics are tightly linked. An effective-pressure dependent friction law already exist, but, unfortunately, subglacial water pressure cannot be easily assessed. Most of the existing subglacial hydrological models deal with a distributed inefficient drainage system and a channelized efficient drainage system as it is thought to appear in the reality. These approaches lead to a dependence between the position of the efficient drainage system and the geometry of the grid that is used to perform the modelling. Our approach is based on a double continuum method in which the water pressure is computed using the Darcy equation in two different media. A sediment layer with small hydraulic conductivity represents the inefficient drainage system and an other layer with much greater conductivity plays the role of the efficient drainage system. The coupling and transfer between these two layers is dealt so as to take into account the evolution of the efficient drainage system. The aim of this study is to asses the capabilities and possible limitations of our model to compute the water load at the base of glaciers. We are presenting results both from synthetic and natural cases designed from the Arolla glacier dataset (Swiss Alps) to evaluate the capabilities of our model.